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*Volume 10 (2012) Article 8*

## ***The potential peatland extent and carbon sink in Sweden, as related to the Peatland / Ice Age Hypothesis***

by L.G. Franzén, F. Lindberg, V. Viklander & A. Walther

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### **Summary**

Peatlands cover approximately 65,600 km<sup>2</sup> (16 %) of the Swedish land area. The available areas suitable for peatland expansion are far from occupied after ca. 12,000 years of the present interglacial. We estimate the potential extent of peatland in Sweden, based on slope properties of possible areas excluding lakes and glaciofluvial deposits. We assume no human presence or anthropic effects, so the calculation is speculative. It may have been relevant for previous interglacials. We calculate the potential final area of peatlands in three scenarios where they cover all available land with different maximum slope angles (1–3 °) using a Digital Elevation Model (DEM). The three scenarios yield potential peatland areas of 95,663 km<sup>2</sup> (21 % of total available area), 168,287 km<sup>2</sup> (38 %) and 222,141 km<sup>2</sup> (50 %). The relative increases from the present 65,600 km<sup>2</sup> are 46, 157 and 239 % respectively. The slope scenarios give CO<sub>2</sub> uptake rates of 8.9–10.8, 18.1–22.4 and 24.6–30.5 Mt yr<sup>-1</sup>. Under global warming conditions with isotherms moved northwards and to higher altitudes, following an increase of raised bog area, the CO<sub>2</sub> uptake rates might increase to 12.2–13.8, 24.4–27.7 and 33.5–37.9 Mt yr<sup>-1</sup>; i.e. up to 4.3–4.9 vpb of atmospheric CO<sub>2</sub>. If we make the speculative extrapolation from Sweden to all high latitude peatlands, and assume that all suitable areas with slope angle ≤ 3 ° become occupied, the global peatland CO<sub>2</sub> sink might approach 3.7 Gt yr<sup>-1</sup> (about 2 vpm yr<sup>-1</sup>) and potentially cause a net radiative cooling approaching 5 W m<sup>-2</sup>.

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### **Citation**

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### **Carbon dioxide – our salvation from a future ice age?**

jueves, 08 de noviembre de 2012 [University of Gothenburg](#)

Mankind's emissions of fossil carbon and the resulting increase in temperature could prove to be our salvation from the next ice age. According to new research from the University of Gothenburg, Sweden, the current increase in the extent of peatland is having the opposite effect.

“We are probably entering a new ice age right now. However, we're not noticing it due to the effects of carbon dioxide”, says researcher Professor Lars Franzén.

Looking back over the past three million years, the earth has experienced at least 30 periods of ice age, known as ice age pulses. The periods in between are called interglacials. The researchers believe that the Little Ice Age of the 16<sup>th</sup> to 18<sup>th</sup> centuries may have been halted as a result of human activity. Increased felling of woodlands and growing areas of agricultural land, combined with the early stages of industrialisation, resulted in increased emissions of carbon dioxide which probably slowed down, or even reversed, the cooling trend.

“It is certainly possible that mankind's various activities contributed towards extending our ice age interval by keeping carbon dioxide levels high enough,” explains Lars Franzén, Professor of Physical Geography at the University of Gothenburg.

“Without the human impact, the inevitable progression towards an ice age would have continued. The spread of peatlands is an important factor.”

Peatlands act as carbon sinks, meaning that they absorb carbon dioxide from the atmosphere. They are a dynamic landscape element and currently cover around four percent of the earth's land area. Most peatlands are found in temperate areas north and south of the 45th parallel.

Around 16 percent of Sweden is covered by peatland. Peatlands grow in height and spread across their surroundings by waterlogging woodlands. They are also one of the biggest terrestrial sinks of atmospheric carbon dioxide. Each year, around 20 grams of carbon are absorbed by every square metre of peatland.

“By using the National Land Survey of Sweden's altitude database, we have calculated how much of Sweden could be covered by peatlands during an interglacial. We have taken a maximum terrain incline of three degrees as our upper limit, and have also excluded all lakes and areas with substrata that are unsuitable for peatland formation.”

The researchers found that around half of Sweden's surface could be covered by peat. In such a case, the carbon dioxide sink would increase by a factor of between six and ten compared with the current situation.

“If we accept that rising levels of carbon dioxide in the atmosphere lead to an increase in global temperature, the logical conclusion must be that reduced levels lead to a drop in temperature.”

The relationship between carbon dioxide and temperature is not linear. Instead, lower levels result in a greater degree of cooling than the degree of warming achieved by a corresponding increase.

“There have been no emissions of fossil carbon during earlier interglacials. Carbon sequestration in peatland may therefore be one of the main reasons why ice age conditions have occurred time after time.”

Using calculations for Swedish conditions, the researchers are also producing a rough estimate of the global carbon sink effect if all temperate peatlands were to grow in the same way.

“Our calculations show that the peatlands could contribute towards global cooling equivalent to five watts per square metre. There is a great deal of evidence to suggest that we are near the end of the current interglacial.”

Professor Franzén and three other researchers have published their findings in the journal *Mires and Peat*.

1. Franzén, L.G., F. Lindberg, V. Viklander & A. Walther (2012) The potential peatland extent and carbon sink in Sweden, as related to the Peatland / Ice Age Hypothesis. *Mires and Peat* 10(8):1-19.



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## Carbon Dioxide: Our Salvation from a Future Ice Age?

*ScienceDaily* (Nov. 8, 2012) — Humankind's emissions of fossil carbon and the resulting increase in temperature could prove to be our salvation from the next ice age. According to new research from the University of Gothenburg, Sweden, the current increase in the extent of peatland is having the opposite effect.

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1. Franzén, L.G., F. Lindberg, V. Viklander & A. Walther. **The potential peatland extent and carbon sink in Sweden, as related to the Peatland/Ice Age Hypothesis.** *Mires and Peat*, 2012

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